Brief NMEA2000

The marine electronics industry utilized CAN as the basis to develop the bi-directional multi-transmitter/multi-receiver instrument network to interconnect marine electronic devices, NMEA 2000.

In collaboration with IEC TC 80 Working Group 6, the NMEA 2000 Standards Committee and Working Group 6 jointly developed IEC 61162-3 which references the National Marine Electronics Association's NMEA 2000 with specific rules for SOLAS Class Vessels

The NMEA 2000 network allows multiple electronic devices to be connected together on a common channel for the purpose of easily sharing information. Because it is a network, and because multiple devices can transmit data, a more comprehensive set of rules is required that dictate the behavior of the members of the network. CAN automatically provides some of these rules – mostly for control of access to the network, packet transmission, and error detection.

The maximum length of the network is controlled by the CAN requirement that all nodes on the network sample the same bit at the same time. Theoretically this translates to the following:

• 1,000 kbits/second - 25 meters

• 500 kbits/second - 75 meters

• 250 kbits/second - 200 meters – NMEA 2000 Standard

• 125 kbits/second - 500 meters

• 62.5 kbits/second - 1100 meters

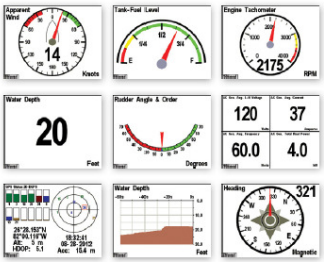
WHY NMEA 2000,

Because is :

1. Easy to install and to maintain
2. Less expensive to install and can fit very constraint condition
3. Robust equipment
4. Very easy to expand ,add new equipment
5. Easy to monitor and to debug
6. Is SOLAS approved

What SBC NIS srl can do for your NMEA2000 project :

- Design the network and select appropriate equipment for the function on board
- Supply the equipment and accessories
- Commissioning and test on board
- Interfacing NMEA2000 network with other network on board (MODBUS TCP/IP , Ethernet)
- Interfacing non compliant NMEA2000 , equipment within the network



DSM250
Multi-Function Color Display

DSM150

will directly connect with any NMEA 2000 network and with the exception of AIS data will display any or all information captured throughout the vessel. Various audio and visual alarms are also programmable.
The DSM150 displays a multitude of information including AC power, anchor status, battery, depth, electrical
distribution, engine, environment, fuel management, GPS, heading, navigation, pressure/vacuum, rudder, speed, status indicators, tanks, temperature, time, transmission, water makers, weather, wind and more.

Parameter	Value	Comment
NMEA 2000® Connector	DeviceNet Micro-C	With Included Adapter
Display Technology	Active Matrix TFT LCD	Sunlight Readable
Display Resolution	320 x 240 Pixels	QVGA Resolution
Display Viewable Area	70.07mm W x 52.56mm H	3.5" Diagonal
Display Brightness	800 NIT (cd/m²)	
Display Backlighting	LED	3 User-Programmed Levels 0-100%
Keyboard	5 Silicone Rubber Keys	LED Backlighting

DSM250

is a high-resolution sunlight viewable color display that interprets and displays
NMEA 2000® instrument, navigation, and vessel monitoring data.
The DSM250 will directly connect with any NMEA 2000® network and with the exception of AIS data will display any or all information captured throughout the vessel.

Display Technology	Active Matrix TFT LCD	Sunlight Readable
Display Resolution	320 x 240 Pixels	QVGA Resolution
Display Viewable Area	70.07mm W x 52.56mm H	3.5" Diagonal
Display Brightness	800 NIT (cd/m²)	
Display Backlighting	LED	3 User-Programmed Levels 0-100%
Keyboard	5 Silicone Rubber Keys	LED Backlighting

TSM800C
8" Vessel Monitoring and Control Touchscreen

TSM800C

- 8" TFT LCD Panel, LED Backlit
- Widescreen Aspect Ratio 5:3
- 800 x 480 Pixels
- 600 nits Brightness (Optically Bonded)
- Solid State Disk Drive
- Fanless Cooling System
- Flush or VESA Mounting
- Dual CAN Bus for Single or Redundant NMEA 2000® Network Connections

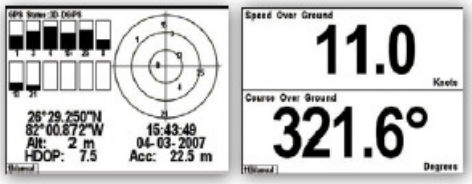
TSM1330C

- 13.3" TFT LCD Panel, CCFL Backlit
- Widescreen Aspect Ratio 16:10
- 1280 x 800 Pixels
- 400 nits Brightness (Optically Bonded)
- Solid State Disk Drive
- Fanless Cooling System
- Flush or VESA Mounting
- Dual CAN Bus for Single or Redundant NMEA 2000® Network onnections

Navigation Instruments

GPS200 - *GPS Antenna/Receiver*
WSO100 - *Ultrasonic Wind and Weather Station*
SSC200 - *Solid State Compass*
DST110 - *Depth/Speed/Temperature Triducer*

GPS200 is a state-of-the-art 32 channel GPS antenna and receiver capable of producing five position fixes per second. The GPS200 has unprecedented sensitivity and can even be mounted underneath a fiberglass deck. An additional benefit of the GPS200 is that it broadcasts precision magnetic variation information **using the current position and world magnetic model (WMM-2010).**



DSM150 & DSM250 Screen Shots

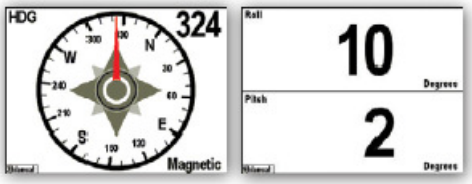
The GPS200 antenna/receiver is a **plug-and-play device** that is fully compliant and certified to the NMEA 2000® Standard. It will directly connect to any NMEA 2000® network and communicate with navigational software, chart plotters, autopilots and dedicated instrument displays – such as DSM150 or DSM250 graphical display – and its compact, waterproof housing provides years of reliable performance.
The GPS200 automatically decodes GPS correction signals from Satellite Based Augmentation Systems (SBAS) including the North American Wide Area Augmentation System (WAAS), the European Geostationary Navigation Overlay System (EGNOS), or the Asian Multifunctional Transport Satellite-based Augmentation System (MSAS) to provide better than 2.5m accuracy.

WSO100 Ultrasonic Wind and Weather Station measures wind speed and direction, air temperature, barometric pressure, and relative humidity. The wind measurement is performed using ultrasonic sensors, which means there are no moving parts to wear out or to get caught in the rigging.
The WSO100 accurately measures wind speed and direction even when tilted, making it ideally suited for heeled sailboats or powerboats operating in pitching and rolling seaways.
When used with displays (DSM150, DSM250, N2KView®), you can view apparent wind speed and direction, humidity, air temperature, barometric pressure (with graphs to see trends), wind chill factor, heat index, and dew point. If you add speed through water (DST110), GPS (GPS200) and compass (SSC200), you can view true vessel referenced wind speed and direction as well as ground referenced speed and direction

DSM150 & DSM250 Screen Shots

SSC200 is a **solid state, rate gyro electronic compass** that provides better than 1° heading accuracy through ±45° of roll and pitch angle, and better than 1° roll and pitch accuracy in static conditions. Each SSC200 is factory calibrated for maximum accuracy. It delivers precise, reliable heading information ten times per second, plus vessel attitude including pitch and roll readings once per second. A micro machined rate gyro is used by advanced stabilization algorithms to provide accurate, stable readings during dynamically changing conditions such as hard turns or rough seas, making it an ideal heading sensor for autopilot applications

Parameter	Value	Comment
Static Heading Accuracy	<1° RMS	±45° Pitch and Roll - 15°C to 35°C
Heading Display Resolution	0.1°	
Settling Time	1 Second	To Static Accuracy after 35°/Second Turn
Heading Update Rate	10 per Second	
Heading Deviation	Yes	Automatic
Alignment Calibration	Yes	In Boat Calibration with Maretron Displays
Pitch and Roll Range	±80°	
Pitch and Roll Accuracy	<1°	±45° Pitch and Roll - 15°C to 35°C
Pitch and Roll Display Resolution	0.1°	With Maretron Display
Pitch and Roll Update Rate	1 per Second	
Pitch and Roll to Boat Alignment	Yes	In Boat Calibration with Maretron Displays
Rate of Turn Range	0° - 90°/ Second	At 0° Pitch and Roll
Rate of Turn Accuracy	±1° per Second	0° Pitch and Roll - 15°C to 35°C
Rate of Turn Update Rate	10 per Second	
NMEA 0183 Standard	Compatible	Up to 38,400 Baud (40 Hz Update Rate)



DSM150 & DSM250 Screen Shots

Engine Monitoring

EMS100 - *Analog Engine Monitoring System*
FFM100 - *Fuel Flow Monitor*
J2K100 - *J1939 to NMEA 2000® Gateway*

EMS100 plugs directly into engine wiring harnesses and converts analog signals such as water temperature and oil pressure to the new marine digital interface (NMEA 2000®). Critical engine data is then distributed throughout the vessel over a single cable where it can be monitored by any NMEA 2000® compatible display
The EMS100 is compatible with Yanmar engines only

The EMS100 provides these functions:

- Tachometer
- Engine Hours
- Coolant Water Temperature
- Engine Oil Pressure
- Boost Pressure
- Charging Voltage
- Drive Trim
- Fuel Filter Alarm
- Coolant Water Level Alarm
- Engine Oil Pressure Alarm
- Exhaust (Salt Water Flow) Alarm
- Coolant Water Temperature Alarm
- Boost Alarm

The FFM100 uses state-of-the-art, **positive displacement metering technology** for unprecedented accuracy. Additional benefits of the positive displacement metering technology are the elimination **of flow conditioning components such as straighteners and pulsation dampers.** Other flow meter technologies require flow conditioning components that increase system and installation cost. **The FFM100 also uses true temperature compensation** with embedded temperature sensors within the meters. The returning fuel is generally hotter than the supply fuel and if not properly compensated, inaccuracies as much as 5% can occur in computing the engine's fuel consumption. The FFM100 also **detects momentary reverse flow in the fuel lines** due to fluctuating pressure caused by the injection pump. Less accurate systems count the reverse fuel flow as part of the consumed fuel where the FFM100 properly accounts for momentary reverse flow. Lastly, the FFM100 **can be used for fluid types other than fuel (e.g., water, oil, etc.)** by ordering the appropriate flow sender.

J2K100 attaches directly into **J1939** networks of compatible engines, transmissions, and gensets and converts the J1939 data to the new marine digital interface (NMEA 2000®). Critical engine, transmission, and genset data is then distributed throughout the vessel over a single cable where it can be monitored by any NMEA 2000® compatible display.
The **J2K100 converts** the following information:

- AC Generator Current • Engine Oil Pressure • Percent Engine Torque
- AC Generator Frequency • Engine Oil Temperature • Rated Engine Speed
- AC Generator Voltage • Boost Pressure • VIN
- Tachometer • Fuel Rate Monitoring • Software ID
- Engine Hours • Charging Voltage • Transmission Gear
- Coolant Pressure • Percent Engine Load • Transmission Oil Pressure
- Coolant Water Temperature • Percent Engine Load • Transmission OilTemperature

Electrical Monitoring and Control

ACM100 - *Alternating Current Monitor*
DCM100 - *Direct Current Monitor*
DCR100 - *Direct Current Relays*
RIM100 - *Run Indicator Module*

ACM100 : NMEA 2000® Interface / Waterproof Connectors /Sealed Waterproof Enclosure **Opto-Isolated** from NMEA 2000® Eliminating Potential Ground Loops /Monitoring of busses carrying AC power and transmitting: - Voltage ; - Frequency

Monitoring **AC Power Sources** such as Utilities and Generators and transmitting:

- Voltage
- Current
- Frequency
- Real Power
- Reactive Power
- Apparent Power
- Power Factor
- Total Energy Imported
- Total Energy Exported

PART NUMBER	DESCRIPTION
ACM100-01	Alternating Current (AC) Monitor
M000630	100 Amp AC Transducer with Cable
M000612	400 Amp AC Transducer with Cable

The DCM100 is used to **monitor DC loads** like inverters, windlasses, DC refrigerators, or any DC branch circuit. When the DCM100 is used to **monitor batteries**, sophisticated circuitry and software algorithms monitor **battery temperature**, **load current, charging current** and terminal voltage to precisely compute battery state of charge, and time remaining. To measure current, the DCM100 uses an included state-of-the-art **Hall effect current sensor** which simply slips over the wire – you don't have to break connections or install connectors as you do with inline shunts used by other solutions. Best of all, the DCM100 is NMEA 2000® certified so you can view any and all DC information anywhere on the vessel using a compatible NMEA 2000® display.

PART NUMBER	DESCRIPTION
DCM100-01	Direct Current (DC) Monitor
FC01	DCM100 Battery Harness with Fuse
LEMHTA200-S	200 Amp Current Transducer with Cable
LEMHTA400-S	400 Amp Current Transducer with Cable
LEMHTA600-S	600 Amp Current Transducer with Cable
TR3K	DCM100 Ring/Under Bolt Temperature Probe

DCR100 contains 6 Direct Current (DC) relays, each capable of switching up to 10 amps. The DCR100 connects directly to an NMEA 2000® network, so you can turn on and off the relays from any device onboard or remotely running Maretron's N2KView® software. The DCR100 easily handles resistive DC loads like lights, or inductive DC loads like pumps and motors

- Six Relays for On / Off Control Over NMEA 2000® Network
- Each Relay Capable of Carrying Up to 10 amps
- Individual Relay Electrical Current Monitoring
- Automatic Relay Over Current Shutdown (Shuts Down at ≈ 12 amps)
- Automatic Relay Thermal Shutdown (Over Temperature Protection

RIM100 Run Indicator Module monitors both AC and DC electrical circuits and reports, over an NMEA 2000® network, whether or not the electrical circuit is energized and running. The RIM100 works equally as well for monitoring manually switched loads (e.g., running lights, anchor lights, or deck lights) as it does for automatically switched loads. Monitoring automatically switched loads (e.g., bilge pumps, engine exhaust/intake fans, and transfer pumps) via the RIM100 is especially useful because you know exactly when equipment is, or isn't running.

General Systems Monitoring and Recording

SIM100 - *Switch Indicator Module*
FPM100 - *Fluid Pressure Monitor*
RAA100 - *Rudder Angle Adapter*
TMP100 - *Temperature Module*
VDR100 - *Vessel Data Recorder*

PART NUMBER	DESCRIPTION
SIM100-01	Switch Indicator Module
SH-449CSTE	Smoke/Heat Detector
BHW100	Bilge High Water Detector
CO-CD1224T	Carbon Monoxide (CO) Detector (Surface Mount White)
VS-07.0HG	Vacuum Switch (7" Hg or 24kPa)
MS-1035	Magnetic Switch Rectangular (Indoor)
MS-1085-N	Magnetic Switch Rectangular (Outdoor)
MS-1055-N	Magnetic Switch Cylinder (Indoor/Outdoor)
MS-1075	Magnetic Switch Recessed (Indoor/Outdoor)
10233	1" FPT Cooling Water Flow Switch
10271	1-1/2" FPT Cooling Water Flow Switch
10231	2" FPT Cooling Water Flow Switch

SIM 100 Switch Indicator Module monitors switch closure devices including, but not limited to, safety equipment (e.g., heat, smoke, carbon monoxide, explosive vapor detectors), security systems (e.g., motion, vibration, glass break, door and port hole magnetic switches), and vessel monitoring equipment (e.g., valve closed/open, high water bilge). The SIM100 continually monitors these switch closure devices and broadcasts information over the NMEA 2000® network about the switch state so the crew can be alerted to potential conditions or problems that warrant further investigation. Advanced features of the SIM100 include the ability to detect whether or not power has been disconnected from the monitored device or if the signal wires have been disconnected due to either corrosion, tampering, or for any other reason (if the monitored device is so equiped).

RAA100 is used to adapt commercially available resistive rudder senders to the NMEA 2000® network. This allows you to observe rudder angle anywhere on the vessel where there are NMEA 2000® compatible displays such as the Maretron DSM150 or DSM250.

TMP100 measures the temperature for up to 6 temperature probes and reports the information over an NMEA 2000® network. The TMP100 supports up to 4 thermistor probes and 2 high temperature thermocouple probes. Optional thermistor probes (-20°C to 80°C or -4°F to 176°F) cover a wide range of applications including cabin air temperature, engine room air temperture, refrigerator/ freezer temperature, under bolt temperature (inverters, charges, pumps, motors, etc.), tank temperatures (live well bait, hot water, etc.), and air duct temperatures. The optional thermocouple probes (0°C to 900°C or 32° to 1652°F) are used to measure Exhaust Gas Temperature (EGT) as part of a comprehensive fuel management system.

PART NUMBER	DESCRIPTION
TMP100-01	Temperature Module
TR3K	TMP100 Ring/Under Bolt Temperature Probe
TP-AAP-1	TMP100 Ambient Air Temperature Probe
TP-IP-1	TMP100 Immersion (Tanks, Plenums, etc.) Temperature Probe
TP-EGT-1	TMP100 Exhaust Gas Temperature (EGT) Probe

The following accessories are available for the TMP100:

TR3K *TP-AAP-1* *TP-IP-1* *TP-EGT-1*

Vessel Data Recorder (VDR100) is used to record messages transmitted from every product interconnected on the vessel's NMEA 2000® network. Each message is stored using solid-state memory technology with simple data retrieval via a removable USB flash drive. The supplied **16 Gbyte USB Flash Drive** will hold weeks or more of data, and with the optional purchase of a larger USB Flash Drive, a year or more of data can be stored. And you never have to worry about losing the most recent data because the **VDR100 uses a circular buffer** where the oldest data is overwritten only after the entire memory is filled

Data Recorded on Solid State Memory via Removable USB Flash Drive

- Circular Buffer Preserves Latest Recorded Data while Oldest Data Overwritten when Memory is Full
- Recorded Data Available for Performance Analysis, Vessel Tracking, Preventive Maintenance, and More
- Optional Waterproof USB Flash Drive Cover
- **Free Data Extraction Software (N2KExtractor™)** Builds Comma Delimited Files for your customized Data Analysis

Tank Monitoring

FPM100 – *Fluid Pressure Monitor*
TLM100 – *Tank Level Monitor (Max 40" Depth)*
TLM150 – *Tank Level Monitor (Gasoline)*
TLM200 – *Tank Level Monitor (Max 104" Depth)*
TLA100 – *Tank Level Adapter*

FPM 100 Fluid Pressure Monitor is used to adapt up to six pressure transducers to the NMEA 2000® network (pressure transducers sold separately). This allows you to observe fluid pressures and tank levels anywhere on the vessel where there are NMEA 2000® compatible displays.

The FPM100 also has a tank level mode, so that fluid levels in a tank can be monitored via a pressure transducer mounted at the bottom of the tank and transmitted over the NMEA 2000® network.

PART NUMBER	DESCRIPTION
FPM100-01	Fluid Pressure Monitor
PT-0-3PSI-01	Pressure Transducer 0 to 3 PSI
PT-0-5PSI-01	Pressure Transducer 0 to 5 PSI
PT-0-10PSI-01	Pressure Transducer 0 to 10 PSI
PT-0-50PSI-01	Pressure Transducer 0 to 50 PSI
PT-0-100PSI-01	Pressure Transducer 0 to 100 PSI
PT-0-300PSI-01	Pressure Transducer 0 to 300 PSI
PT-0-500PSI-01	Pressure Transducer 0 to 500 PSI
PT-0-1000PSI-01	Pressure Transducer 0 to 1000 PSI
PT-0-3000PSI-01	Pressure Transducer 0 to 3000 PSI
PT-0-5000PSI-01	Pressure Transducer 0 to 5000 PSI
PT-SNUB-01	Pressure Snubber
PT-V-0-1BAR-01	Pressure Transducer Vacuum to 1 Bar

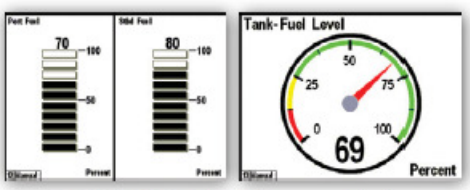
All tank monitors **can be custom calibrated for odd shaped tanks** providing unprecedented accuracy, especially when compared to older analog gauge technologies. **Tank monitors can even be programmed with the tank capacity** so that multiple tanks can be combined into a single total tank gauge for display. You no longer have to mentally add up multiple tanks to figure how much water or fuel is onboard. And a real plus is that **user interface products will combine information from the tank monitors, fuel flow monitors, and GPS speed information to provide you with trip parameters like distance and time to empty**

- NMEA 2000® interface
- Adapts up to six pressure transducers to the NMEA 2000® network
- Each channel independently programmed to match pressure transducer characteristics
- Each channel independently programmed in pressure/ vacuum mode or tank level mode

PART NUMBER	DESCRIPTION
TLM100-01	Tank Level Monitor (40" Depth Tanks)
TA-5H-1.25BSP	1.25" BSP Displacement Hull Tank Adapter
TA-5H-1.5NPT	1.5" NPT Displacement Hull Tank Adapter
TAL-5H	SAE 5-Bolt Pattern Black Water Airlock
TAL-1.25BSP	1.25" BSP Black Water Airlock
TAL-1.5NPT	1.5" NPT Black Water Airlock
TFT-5H	SAE 5-Bolt Pattern Non-Displacement Hull Focus Tube
TFT-1.25BSP	1.25" BSP Non-Displacement Hull Focus Tube
TFT-1.5NPT	1.5" NPT Non-Displacement Hull Focus Tube

PART NUMBER	DESCRIPTION
TLM150-01	Tank Level Monitor (24" Depth Gasoline Tanks)
TA-5H-1.25BSP	1.25" BSP Displacement Hull Tank Adapter
TA-5H-1.5NPT	1.5" NPT Displacement Hull Tank Adapter
TFT-5H	SAE 5-Bolt Pattern Non-Displacement Hull Focus Tube
TFT-1.25BSP	1.25" BSP Non-Displacement Hull Focus Tube
TFT-1.5NPT	1.5" NPT Non-Displacement Hull Focus Tube

PART NUMBER	DESCRIPTION
TLM200-01	Tank Level Monitor (104" Depth Tanks)
TA-5H-1.5NPT	1.5" NPT Displacement Hull Tank Adapter



DSM150 & DSM250 Screen Shots

N2KView® Mobile
Vessel Monitoring and Control Software

N2KView® Mobile may be downloaded free of charge directly from Google Play to your Android device or directly to an Apple device from the iTunes store. Although the application is a free download, you will need a OEM Internet Protocol Gateway (IPG100) to get the sensor data onto the vessels Wifi for onboard viewing or onto the Internet for remote viewing.

What makes **N2KView® Mobile** so diverse is its ability to **configure your own screens**. You have complete control of the number of screens, the layout of each screen, and the size and type of each parameter you wish to display. You customize each display exactly the way you want it. You use N2KView® on a computer to design the screens, and then download them to your smart phone or tablet device.

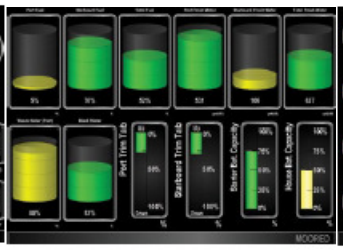
N2KView®
Vessel Monitoring and Control Software

N2KView® is a comprehensive vessel monitoring and control software that goes beyond simple monitoring.

With N2KView® you get additional functionality including alerts, video, control, and fuel management. The alerts functionality allows you to setup as many warnings and alarms as you need so you can be forewarned of potential problems.

With alerts, you can relax knowing that the system is watching for smoke, CO, high bilge water, or anything else you deem important. N2KView® video capability allows you to add cameras as part of the monitoring system - for example a camera in the engine room - or the cameras can be used as part of the security system. The control functionality gives you the ability to manage your electrical system; for example, you can turn lights or pumps on or off directly from N2KView® and even tell if the lights or pumps are burned out and not working. Lastly, the fuel management function uses information from the fuel flow monitor, tank monitors, and GPS to provide advanced information like distance and time to empty as well as fuel rate and fuel economy.

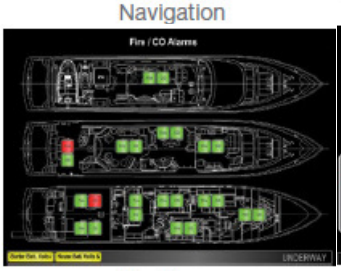
Navigation



Tank Levels

AC Systems

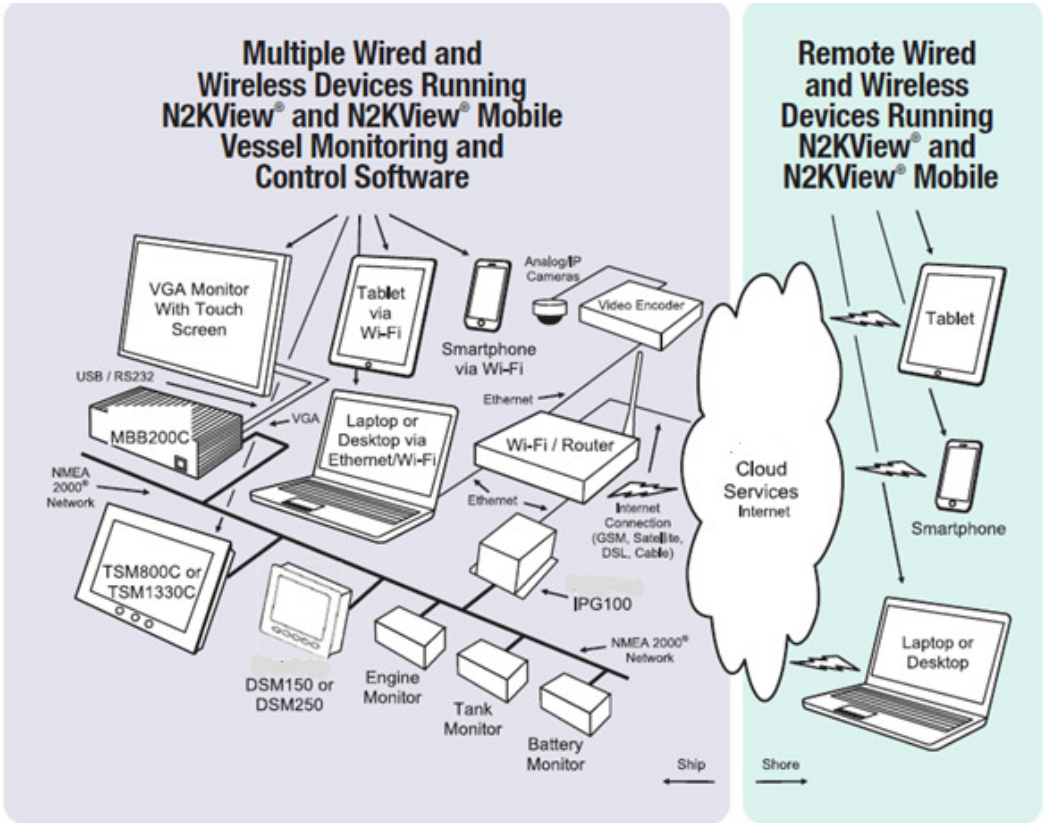
DC Systems



Fire Alarms

Environment

Engines



Cloud Services allows you to remotely and seamlessly connect to your vessel using **N2KView® or N2KView**® Mobile software so you can monitor and control your vessel from anywhere in the world. As long as there is an Internet connection to the vessel, Internet Protocol Gateway (IPG100) will automatically log into Internet cloud server and the vessel's information will be made available to any remote N2KView® or N2KView® Mobile. Connection between your vessel and remote N2KView® software has never been easier, whether your vessel's Internet connection is via a marina WiFi, satellite connection, GSM or cell phone modem, or any other type of Internet connection, you'll have access to the vessel from anywhere in the world.

Using Cloud Services is simple, just imagine receiving an email or text notification from the vessel indicating a problem and you simply log onto the vessel using a smart phone, tablet, or PC. Using N2KView® vessel monitoring and control software you get a better understanding of the problem and you can even initiate a corrective action like resetting tripped breakers, turning on auxiliary pumps or lights. Or maybe you just want to adjust the air conditioner or start the ice maker on your way to the boat. Whatever the reason, Cloud Services provides you with a seamless connection to your vessel for peace of mind and convenient access from anywhere in the world.